REMARKS

In the Office Action dated January 22, 2008, the specification and drawings were objected to. Claims 64 and 66-68 were objected to as depending from a canceled claim; claims 1-2, 4-5, 11-12, 15-16, 19-21, 26, 39, 42-43, 49-50, 53-54, 57-59, 64, 69-71, and 70 were objected to because of non-Americanized spellings. Claims 1 and 39 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kersey (U.S. 5,757,487); claims 2 and 40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kersey in view of Hill (U.S. 2005/0151950); claims 35, 73, and 77 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kersey in view of Waagaard (U.S. 7,019,837); claims 4-6, 10-12, 14-16, 19-21, 22, 26, 28-30, 36, 42-44, 48-50, 52-54, 57-59, 60-, 64, 66-69, 72, and 74 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kersey in view of Prohaska (U.S. 6,208,776); and claims 70-71 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kersey in view of Prohaska and further in view of Hodgson (U.S. 6,269,198). The rejections are traversed, and reconsideration of the claims is respectfully requested. All amendments to the claims have been made only to correct a dependency and in response to the objection regarding the spelling of various terms.

Objections to Specification and Drawings

A substitute specification is attached hereto which has been amended to address the Examiner's objections regarding headings and spellings. With respect to the objection to the drawings, the specification has been amended to correct the reference to "35." In view of these amendments, it is believed that the objections to the specification and drawings have been fully addressed, and withdrawal of the objections is respectfully requested.

Rejections Under 35 U.S.C. 102

Independent claims 1 and 39 have been rejected as being anticipated by Kersey. The rejection is traversed because Kersey does not teach or disclose all of the elements recited in either of claims 1 or 39.

Claim 1 recites a method of measuring a selected parameter which comprises launching optical pulses at preselected wavelengths into an optical fiber. Reflectors are arrayed along the optical fiber to form an array of sensor elements, where the optical path length between the reflectors is dependent upon the selected parameter. As described in the specification, the sensor elements are the fiber between adjacent reflectors. Depending on the parameter being measured, the optical path length of the portion of the fiber between reflectors (i.e., the sensor element) varies depending on the parameter being measured. As further recited in claim 1, a returned optical interference signal for each of the preselected wavelengths is detected, and, from this interference signal, the absolute optical path length between two reflectors is determined. Claim 1 further recites that the value of the selected parameter is determined from the determined optical path length.

Kersey does not disclose all of the elements recited in claim 1. Rather, Kersey discloses a system that includes an array of groups of weakly reflecting broadband grating elements 13. The grating elements 13 are the sensors, and not the fiber between the elements 13. Kersey, 3:1-7. Each group of grating elements 13 reflect at a particular center wavelength. Thus, when a series of pulses is launched from the series of lasers 14-N at a particular wavelength, only those elements 13 having a center wavelength at the launched wavelength will return a reflected light pulse. Kersey, 3:34-36. The grating elements 13 are evenly spaced along the length of the fiber so that a set of reflected pulses is produced at regular intervals. The spacing L between the elements 13 is determined by the pulse width of the input pulse provided by the laser source, and the repetition rate of the laser is set to allow all of the reflection components to be detected prior to the production of the next input pulse. Kersey, 3:39-52; 4:34-37. Detection of the amplitude of the reflected pulses provides a measure of the reflectivity of the grating 13 and thus an indication of the parameter (e.g., strain) being measured. More specifically, as the grating elements 13 are strained, the reflection profile moves off the nominal center wavelength and the reflectivity falls. The change in reflectivity is an indication of the magnitude of the strain. Kersey, 3:56-4:3.

Accordingly, Kersey does not disclose an array of reflectors where the optical path length between the reflectors is dependent on the selected parameter, as recited in claim 1. Rather, in

Kersey, the reflectors themselves are the sensor elements which are dependent on the selected parameter. Moreover, Kersey does not determine from an optical interference signal the absolute optical path length between two reflectors (as recited in claim 1), and Kersey does not determine the value of the selected parameter from the determined optical path length (as further recited in claim 1). In fact, Kersey does not disclose anything about determining an absolute optical path length but, instead, simply detects the amplitude of the reflected signals from each of the grating elements to determine the value of the selected parameter. Thus, Kersey does not disclose all of the elements recited in claim 1.

Kersey is similarly deficient with respect to independent claim 39. Claim 39 recites an apparatus for measuring a selected physical parameter comprising an optical fiber having reflectors, where the optical path length between the reflectors is dependent upon the selected parameter. Signal detection means detect a returned optical interference signal for each of the preselected wavelengths of optical pulses launched into the fiber. Signal processing means determines from the optical interference signal the absolute optical path length between two reflectors. The signal processing means also determines the value of the selected parameter from the determined optical path length.

Again, Kersey does not disclose an array of reflectors in which the optical path length between the reflectors is dependent upon the selected parameter. Instead, Kersey's grating elements 13 are the sensors which have a reflectivity at a selected wavelength that is dependent upon the selected parameter. In addition, in Kersey, the absolute path length between reflectors is not determined from a returned signal, and the value of the selected parameter is not determined from the determined path length. Rather, Kersey only detects the reflectivity as indicated by the returned pulses, where the amplitude of the reflected signals is indicative of the value of the selected parameter. Thus, Kersey also does not disclose all elements recited in claim 39.

In view of the foregoing, Kersey does not anticipate claims 1 and 39, or any of the claims that are variously based on claims 1 and 39. Accordingly, withdrawal of the rejection of claims 1 and 39 in view of Kersey is respectfully requested.

Rejections Under 35 U.S.C. 103

With respect to dependent claims 2, 4-6, 10-12, 14-16, 19-22, 26, 28-30, 35, 36, 40, 42-44, 48-50, 52-54, 57-60, 64, and 66-74, each of those claims are based on either claim 1 or claim 39. The rejections of each of these dependent claims have been made in view of Kersey in a hypothetical combination with either Hill, Waagaard, Prohaska and/or Hodgson. In addition, independent claim 77 has been rejected in view of Kersey in combination with Waagaard. However, neither Hill, Waagaard, Prohaska nor Hodgson compensates for the deficiencies of Kersey, which have been discussed above. Accordingly, none of the combinations of Kersey with Hill, Waagaard, Prohaska and/or Hodgson renders any of the dependent claims obvious. Also, the combination of Kersey and Prohaska does not render independent claim 77 obvious.

With respect to the rejection of claims 2 and 40 in view of Kersey and Hill, Hill discloses a lithography system for supporting a wafer. The system includes various interferometry systems to determine information about a location of a stage within the lithography system when an alignment feature on a surface associated with either the stage or the wafer is identified. Hill's interferometry systems, however, do not include an array of reflectors where the optical path length between the reflectors is dependent upon a parameter that has been selected for measurement. Rather, Hill's system simply detects reflections from various types of alignment marks to achieve alignment between a wafer and the lithography tool. Hill also does not determine the absolute optical path length between two reflectors to determine the value of a selected parameter. In fact, Hill does not determine anything with respect to determining an absolute optical path length for any purpose, much less determining the optical path length in the manner recited in claims 2 and 40. Thus, because Hill at a minimum does not compensate for Kersey's deficiencies and also does not disclose or suggest the additional limitations recited in claims 2 and 40, the hypothetical combination of Kersey and Hill does not render claims 2 and 40 obvious.

With respect to the rejection of claims 35, 73, and independent claim 77 in view of Kersey and Waagaard, Waagaard discloses an array of Bragg gratings formed periodically along an optical fiber. Reflected light pulses from the reflectors are detected and processed to detect the transmission phase delay response between each pair of reflectors. Thus, Waagaard, like

Kersey, does not disclose determining from a returned optical interference signal the absolute optical path length between reflectors, and determining the value of the selected parameter from the determined optical path length. As such, Waagaard, at a minimum, does not compensate for Kersey's deficiencies.

In addition, Waagaard does not disclose or suggest removing crosstalk terms from the returned optical interference signal in the manner recited in claims 35, 73, and 77. Instead, Waagaard discloses the use of an inverse scattering algorithm, such as a layer peeling algorithm, to detect the transmission phase delay response between each pair of reflectors while reducing crosstalk from other reflectors within the array. In contrast to the technique recited in claims 35, 73 and 77, Waagaard removes crosstalk by finding a transfer matrix for the first section of the fiber with the first reflector. The transfer matrix relates the forward propagating light and backward propagating light of the first section to the next section of the fiber. Once the transfer matrix is found, the optical fields of the forward and backward propagation light in the next section can be calculated and all reflections involving the first reflector are pulled out from the measurement. The process then repeats for the next section of fiber. Thus, Waagaard does not remove crosstalk terms by subtracting the crosstalk phasor for the nth sensor element from the measured nth sensor element phasor, as recited in independent claim 77 and each of dependent claims 35 and 73. Accordingly, the combination of Kersey and Waagaard does not render independent claim 77 obvious. And, for this additional reason, the combination of Kersey and Waagaard does not render dependent claims 35 and 73 obvious.

With respect to the rejection of dependent claims 4-6, 10-12, 14-16, 19-22, 26, 28-30, 36, 42-44, 48-50, 52-54, 57-59, 60, 64, 66-69, 72 and 74 in view or Kersey and Prohaska, Prohaska discloses a birefringent sensor system 10 having a plurality of sensors 15. Each sensor 15 is tuned to a different wavelength and thus reflects at a different wavelength. A wavelength division multiplexer in the detection system associates a pair of light reflections with a particular sensor on the basis of the wavelength of the reflection. A detection circuit determines the spectral separation between the two reflections from the selected sensor in order to permit a signal processing unit to determine the value of the sensed parameter. Prohaska, 5:4-46. Accordingly, Prohaska, like Kersey, does not disclose determining from a returned optical

interference signal the absolute optical path length between two reflectors, and determining the value of the selected parameter from the determined optical path length. As such, because these limitations are missing from both Kersey and Prohaska, the hypothetical combination of Kersey and Prohaska does not render the various dependent claims obvious.

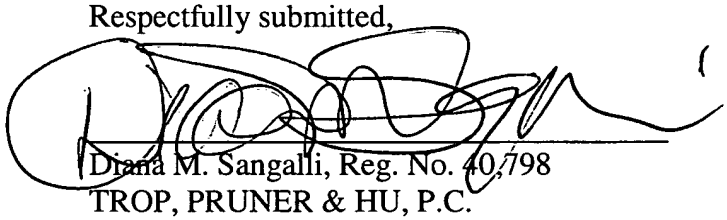
With respect to the rejection of dependent claims 70 and 71 in view of Kersey in combination with Prohaska and Hodgson, Hodgson does not compensate for the deficiencies of Prohaska and Hodgson discussed above. More particularly, Hodgson discloses an acoustic sensing system in which optical signals from the sensors are demodulated and processed to obtain the polar phase which corresponds to the phase difference between the optical beams in the test and reference arm. The time derivative of the polar phase is proportional to the magnitude of the sensed acoustic vibrations. Hodgson, 8:54-10:6. Thus, Hodgson does not detect a returned optical interference signal for each of preselected wavelengths, determine the absolute optical path length from the interference signal, or determine the value of the selected parameter from the determined optical path length. Accordingly, because Hodgson at a minimum does not disclose or suggest the limitations missing from Kersey and Prohaska, claims 70 and 71 are not obvious in view of Kersey in combination with Prohaska and Hodgson.

Because the various combinations of the references do not teach or suggest all of the elements recited in either independent claim 77 or the dependent claims which are variously based on independent claims 1 and 39, none of the combinations of references renders the claims obvious and unpatentable. Accordingly, withdrawal of the rejections and reconsideration of all dependent claims and independent claim 77 are respectfully requested.

CONCLUSION

In view of the foregoing, Applicant respectfully requests withdrawal of the rejections, reconsideration of the pending claims, and a favorable action in the form of a Notice of Allowance. The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 20-1504 (SHL.0434US).

Respectfully submitted,



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